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ABSTRACT

A framework for educational computer usage in grades K-12 is outlined. For each grade level, objectives are shown for the following knowledge areas: computer-related terminology and use; history and development of computers; the use of the computer as a tool; communicating instructions to the computer; social implications; and robotics. Suggested activities correlated to the computer curriculum objectives are separately listed for grades K-2, 3-5, 6-8, and 9-12. A computer curriculum resource bibliography is included. (Author/LMM)

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A Framework For Educational Computer Usage

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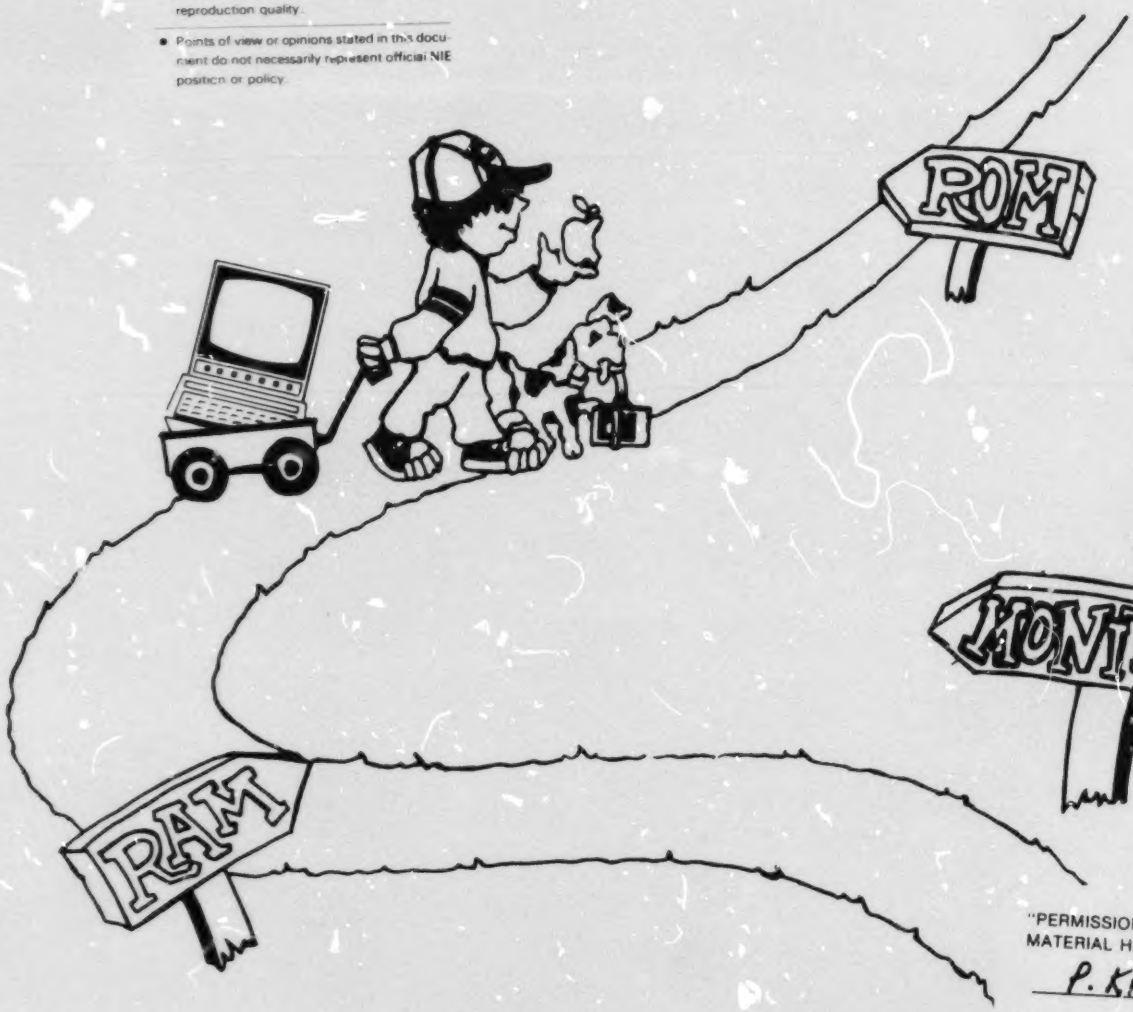

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K-12

Frisco Independent School District

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INTRODUCTION

The Frisco Independent School District deems it necessary to offer an intensive K-12 computer curriculum to every student due to the rapid transition from an industrial society to a highly technological informational society. It is the goal of this district to insure that not only every graduate of Frisco High School, but also district employees and community members are competent to meet these new demands of our society.

Students, regardless of grade level, should be knowledgeable in the following areas:

1. Computer-related terminology and use
2. History and development of computers
3. Use of computer as a tool
4. Communicating instructions to the computer
5. Social implications
6. Robotics

At the elementary level, students will develop an awareness of computers by attending structured classes during their scheduled library periods. This will be accomplished via computer literacy lessons, CAI, and Logo programming.

At the middle school level students will assimilate computer skills through concentrated instruction in the social studies classes. Areas to be emphasized will include computer literacy, CAI, Logo programming, encompassing higher level thinking skills and problem solving, and social implications.

At the high school level within the social studies classes, every student will be assured of instruction in the same skills as those taught at the middle school level. In addition to this, Basic and Pascal computer programming classes will be offered as electives.

Since this is essentially a new curriculum area in the Frisco Independent School District, adjustments in the introduction of skills will be made as prerequisite knowledge is attained. Thus, this curriculum has been designed with flexibility as a prominent factor. The expansion of the present curriculum is contingent upon the experiences and achievements resulting from the current program.

Tentative plans are being formulated to move instruction in Basic to the middle school level and to add another higher level language to the high school curriculum. The curriculum will further be modified in order to keep abreast of swiftly changing developments in the computer field.

Naturally, ongoing staff development will be imperative to the success of any and all computer curriculum undertakings. Just as the curriculum will broaden so too will expand the teacher training objectives.

In conclusion, through a balanced, ever-expanding curriculum, intensive ongoing staff development, community support, and leadership of the school board, the Frisco Independent School District will provide the opportunity to explore the full range of computer applications which assist with day to day operations in today's society.

ESSENTIAL ELEMENTS:	The student will:					
	K	1	2	3	4	5
History and development of computers	Name other forms of primitive computers, i.e., abacus →					
				Discuss inventors who have made significant contributions to computing. →		
				Gain an awareness of the evolution of computers from their rudimentary beginnings to the sophisticated present day developments. →		
Use of the computer as a tool	Manipulate the keyboard utilizing the: arrow keys, escape, space bar, return, and differentiate between I and 1 and O and 0. →					
	Independently place the disk into the disk drive, load the program, and initiate interaction with the computer. →					
	Will interact with the following varieties of software: drill and practice, simulation, tutorial, games. Logo during a regularly scheduled library period. →					
	Develop an awareness that instructions utilized in various software are not uniform. →					
				Use a computer keyboard. →		
				Employ software. →		
				Apply troubleshooting techniques: I for 1, O for 0, plugged in, contrast dial, monitor on, caps lock key, reset key. →		

6	7	8	9	10	11	12

Identify generations of computers: vaccum, transistor, integrated circuits, microchip, silicon chip.

Identify a type of computer with its corresponding generation: Eniac, IBM System/360, Univac, Mark I.

List steps in the evolution of computers from an abacus to punch cards to Eniac to present day microcomputers.

Name computer inventors and relate their contributions to present day computer technology, i.e., Hollerith, DaVinci, Pascal, Jacquard, Babbage, Aiken.

Visit the high school computer lab and become knowledgeable of the graphics tablet, plotter, voice based learning system, big printer, test scanner, word processor.

Effectively use data base software (Personal Filing System, Visicalc, Apple Grade Book).

Review and evaluate software as well as develop his/her own software evaluation form.

Determine which software is most appropriate for various applications.

ESSENTIAL ELEMENTS:

The student will:

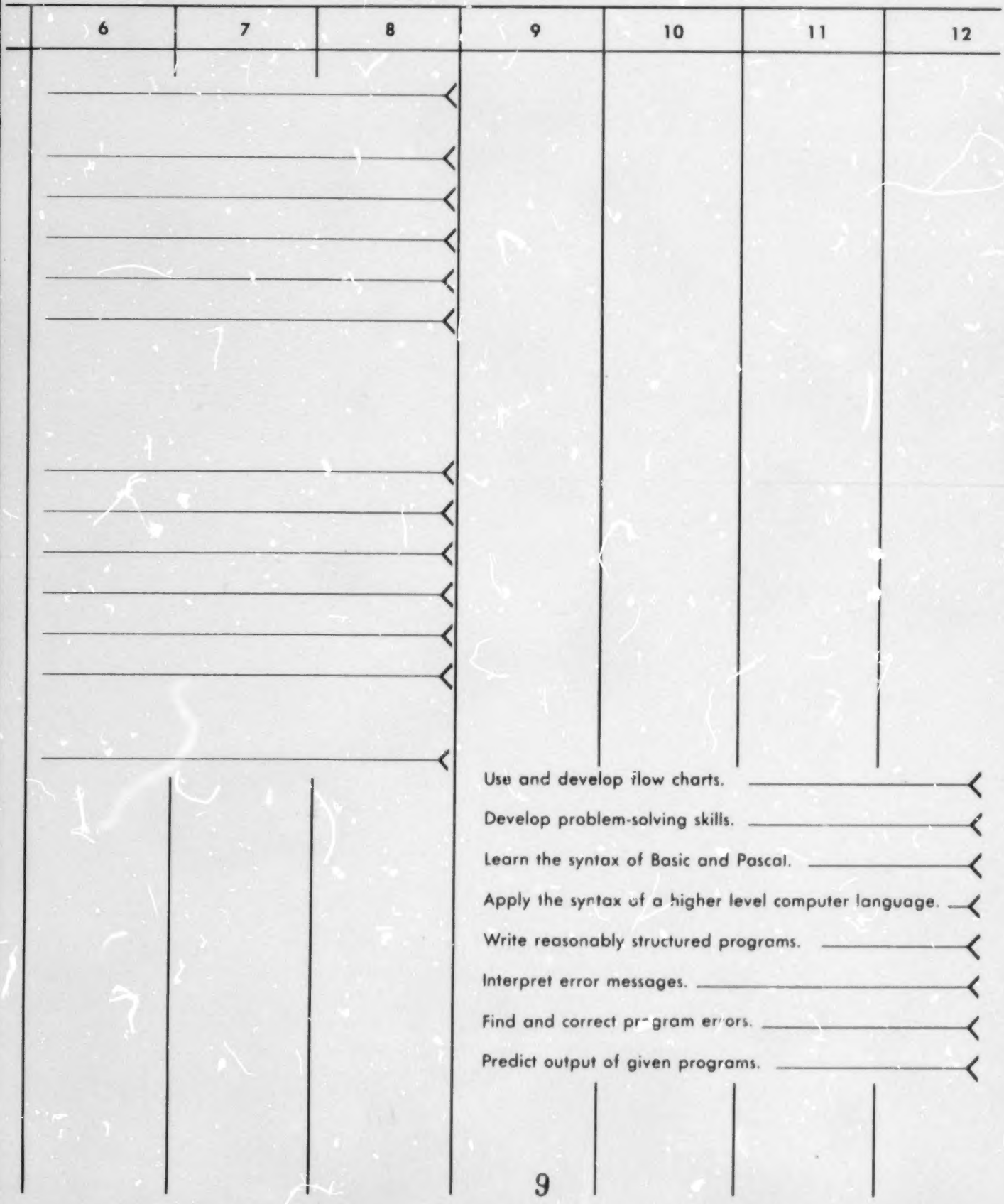
	K	1	2	3	4	5
Computer related terminology and use.	Identify the following hardware terminology: hardware, keyboard, monitor, disk drive, printer, system saver, game paddles. →					
	Identify the following software terminology: software, floppy disk, program, input, output. →					
	Identify the following computer related terminology: space bar, menu, return, reset, escape, arrow keys, boot, load. →					
				List uses of computers in a variety of situations. →		
				Identify the following terms: memory, catalog, bug, debug, edit, file diskette, initialize. →		
				Understand the advantages and limitations of computers: speed, accuracy, repeated operations, artifical information, storing information, working other machines. →		
				Understand uses of computers. →		
				List computer attributes: speed, accuracy, repeated operations. →		
				Classify types of computers: main frames, microcomputers, minicomputers, terminals. →		

6	7	8	9	10	11	12

Identify: bit, byte, RAM, ROM, nibble, K, CPU, transistor, binary language, vaccum tube, microchip, peripheral.

Identify computer terms as listed in *introduction to Computers and Data Processing* by Shelly and Cashman, pp. 1.1-1.2.

ESSENTIAL ELEMENTS:	The student will:					
	K	1	2	3	4	5
Communicating instructions to the computer	Effectively follow step-by-step directions in both computer and noncomputer environments. →					
	Learn the syntax of the LOGO language including the following commands and their abbreviations: forward (FD), back (BK), right (RT), left (LT), showturtle (ST), clearscreen (CS), hideturtle (HT). →					
	Apply the syntax of the Logo language to a problem-solving situation. →					
	Identify and correct errors in the programming message. →					
	Predict the output of given commands. →					
				Use LOGO in application. →		
				Learn syntax of the LOGO language: forward (FD), back (BK), right (RT), left (LT), showturtle (ST), clearscreen (CS), hideturtle (HT), save, edit (ED), penup (PU), pendown (PD), penerase, to, end, repeat, setbackground (SETBG), setpencolor (SETPC), control (N,P,E,C). →		
				Initialize a disc. →		
				Save a program. →		
				Use the printer. →		
				Copy a program. →		
				Edit a program. →		
				Develop an awareness that there are many languages that may be employed to communicate instructions to the computer. →		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Use and develop flow charts.
Develop problem-solving skills.
Learn the syntax of Basic and Pascal.
Apply the syntax of a higher level computer language.
Write reasonably structured programs.
Interpret error messages.
Find and correct program errors.
Predict output of given programs.

ESSENTIAL ELEMENTS:	The student will:					
	K	1	2	3	4	5
Social Implications	Name computerized devices encountered in his everyday life. →					
	Be introduced to various computer-related careers. →					
				Appreciate and reach an understanding of how the computer has impacted society (careers: social, business, educational, and personal lives). →		
Robotics				Define a robot. →		
				Observe a demonstration of a robot. →		
				Describe how robots will impact society and individuals in the future. →		

6	7	8	9	10	11	12

Identify training requirements for computer-related careers.

Identify and discuss regulatory procedures established to insure the integrity of personal data files.

Identify the possible misuse of computers in our society, i.e., illegal money transfers, espionage, pirating.

Identify ways career opportunities will be impacted by computers.

Gain a technical knowledge of the way robots move.

Predict future uses of robotics and discuss its advantages and disadvantages.

SUGGESTED ACTIVITIES CORRELATED TO THE Grades K-2 Computer Curriculum

COMPUTER RELATED TERMINOLOGY

1. Play the "Simon Says" game employing computer terms and requiring students to touch appropriate parts of the computer when Simon says.
2. Play the "What Am I Game?" by allowing one student to choose one of the computer terms and describe it while the other students guess what term is being described.
3. Play the game of "What Term Doesn't Belong?" by listing three related terms plus one additional term not associated with the others. Students must name the term which does not belong with the others.
4. Explain the terms "input" and "output" by comparing them to cake batter and a baked cake.
5. Work computer-generated word finds and crossword puzzles which employ simple computer terms.
6. Read the *Computer Alphabet Book*.
7. Read *Katie and the Computer*.

HISTORY AND DEVELOPMENT OF COMPUTERS

1. Demonstrate primitive forms of computers such as an abacus, stones, ropes with knots.
2. Use transparencies that depict computer history from *Understanding Computers* by Donald Spencer.
3. Color pictures of computers from the *Computer Poster Book* by Donald Spencer.

USE OF THE COMPUTER AS A TOOL

1. Make a large replica of the computer keyboard using styrofoam square food containers as keys.
2. Show the students a faulty diskette to help students understand how they are made and why they must be handled carefully.

COMMUNICATING INSTRUCTIONS TO THE COMPUTER

1. Cook a food item (such as popcorn or no-bake cookies) to demonstrate the importance of following directions step by step. Demonstrate what would happen if directions were not followed by leaving the top off the popcorn popper.
2. Learn Logo terms by having students assume the role of the turtle (complete with costume) and allowing the other students to give basic Logo commands to the turtle.
3. Draw a picture of the turtle or create turtles from paper bowls and assorted fabric scraps.
4. Pair up students and have one of the students draw a picture of what the turtle will do as the other partner gives the commands.
5. Place masking tape on the floor and have students walk through the pattern before attempting to program the design.

SOCIAL IMPLICATIONS

1. Read and discuss *Careers in Computers* by JoAnne Ray.
2. Hear talks by students' parents who have computer related jobs.
3. Conduct a show-and-tell day in which students demonstrate computerized devices and toys such as Speak and Spell, calculators, magic wand books from T.I.
4. Color pictures from *Computer Awareness* by Donald Spencer.
5. Read and elaborate on the *Microcomputer Coloring Book*.

SUGGESTED ACTIVITIES CORRELATED TO THE Grades 3-5 Computer Curriculum

COMPUTER RELATED TERMINOLOGY

1. Write and illustrate a computer dictionary as a class project. This will also reinforce such language arts skills as alphabetizing.
2. Work computer-generated crossword puzzles and word finds employing computer terms.
3. Make a set of Match-Up cards by writing the term on one side and the definition on the other side. Cut each card apart differently, scramble them, and allow students to match them correctly within a set time limit.
4. Play "Tech Tac Toe" with a student being allowed to fill in a square on the tic tac toe board with each correct answer to a question over terminology.
5. View the Minnesota Educational Computing Consortium demonstration disk.
6. Have a race doing math problems between students with pencil and paper and students with calculators or computers.
7. View filmstrip number three from the series "Pebbles to Programs".
8. View posters or transparencies from the *Computer Poster Book* and the *Computer Awareness Book* by Donald Spencer.

HISTORY AND DEVELOPMENT OF COMPUTERS

1. Have students name each computer for a famous computer inventor/contributor and draw an appropriate name label to post on the computer.
2. Make drums of empty containers (ice cream, coffee, oatmeal) and have students drum out a message. This will teach the concept that computers also use coded languages.

USE OF THE COMPUTER AS A TOOL

1. Issue a Computer Operator's license based on various proficiency levels.
2. After the teacher deliberately sabotages the machine (unplugs it, turns monitor off, leaves caps lock key up), have students refer to the troubleshooting techniques chart and correct the error.

COMMUNICATING INSTRUCTIONS TO THE COMPUTER

1. Post student drawn Challenge Posters weekly. Each poster should challenge students to write a program that will result in the output shown on the poster (a diamond, a triangle in each corner of the screen, etc.). At the bottom of each poster include a blank box labelled "The Victors". Allow students to autograph that box only after they have successfully solved the poster's challenge.
2. Play "Find the Bug". Upon being presented with a faulty written program, the student will debug the program to obtain the correct result.
3. Employ flashcards to teach abbreviations of Logo commands.
4. Demonstrate that computers use more than one language just as people do by securing the assistance of a bilingual student.

SOCIAL IMPLICATIONS

1. Cut-out computer related articles from the want ads section and compile a large display.
2. Conduct a Scavenger Hunt with the results being collected in a notebook. Have students collect such items as computer generated grocery tapes, utility bills, receipts from automated bank tellers, airline tickets, universal product code samples, junk mail, library cards, etc.

3. Invite parents to a "Computer Cotillion" party at which students may teach their parents to operate the computers and also demonstrate their own programs.
4. Conduct a survey in which students ask people what they like best about computers and what they fear most about computers.

ROBOTICS

1. Create a computer club which meets after school for more work on programming. Conduct a money-raising project to purchase a robot.
2. Conduct a robot talent show in which students enact dances, etc. as a robot.
3. Conduct a robot building contest.
4. Write stories on "If I Had My Own Robot . . ."

SUGGESTED ACTIVITIES CORRELATED TO THE Grades 6-8 Computer Curriculum

COMPUTER RELATED TERMINOLOGY

1. Filmstrip "What is a Computer" in *Computer Basics* series.
2. "Computers-What Are They?" Computer tutorial with accompanying worksheet.
3. Teach binary numeration.
4. **Alphabet Card Game**. Divide class into 2 teams, giving each person a letter of the alphabet that has been printed on a card. Call out definition and students holding letters that spell the defined term come to front to spell the word. (Letters used more than once in the word must be jumped from place to place). Team to **correctly** spell the term first receives a point.
5. **Karnack**. Put definitions of terms in red ink on index cards and the terms in black ink on other cards. Student with definition holds card to head and reads information on card. Student with corresponding term says term. Good for review.

HISTORY OF COMPUTERS

1. Timeline Activity — p. 20 of *Computer Discovery Workbook*. Insert pupils own historic events (year of birth, year entered school, etc.) Enter historic event in computer history. Guide students to see how much development has occurred in a relatively short time span.
2. Discuss information on pp. 11-23 of *Computer Discovery Workbook*. Define each innovation and corresponding computer and give advantages of each new generation.
3. **Generation Game**. Have 4 cards in front of room denoting 4 teams — 1st Generation, 2nd Generation, 3rd Generation, 4th Generation. Disperse terms, definitions and computer models written on cards to student. Each student must take card and stand in category his/her card represents. As a class, decide which students correctly chose the appropriate category and give points to those who have done so. Generation with the most points wins.
4. Use *Visual Masters for Teaching About Computers* as support material. Also read *Exploring the World of Computers* pp. 23-24 for information. Other background information can be found — *Computer Discovery Workbook* — p. 19, *Understanding Computers (Instructor's Manual)* — pp. 9-23, *Famous People of Computing Poster Book* and the last 4 pages of *Computer Poster Book*.
5. Write a commercial advertising different types of computers, emphasizing capabilities, advantages and innovations.
6. Report — Research an aspect of computer technology. Present a written and/or oral report illustrated by an appropriate 3-dimensional model.

USE OF COMPUTER AS A TOOL

1. List uses for each of the following: graphics tablet, graphics plotter, test scanner, voice-based learning system, word processor, and large printer. Choose one and make a poster depicting future developments and uses.
2. Break up into groups — 1 for PFS and for Grade Book. Use data for each.
3. Filmstrip "Software Question" from *Microcomputing* series.
4. Go over characteristics of good software. Make up individual forms and get into groups to refine list. Use form to actually evaluate software.
5. "**Software Concentration**". Make cards reading Simulation, Tutorial, Data Base, Drill and Practice, Test Editing. Make others reading times tables, averaging grades, recipe file, oil shortage effects, nuclear war effects, "Little Black Book", budget organizer, etc. (Make sure there are equal numbers of both groups). Play "concentration" (matching).

SOCIAL IMPLICATIONS

1. Consult the following for background information: *Underanding Computers* p. 113-136 and p. 37-40 of workbook; *What's It Like to Work With Computers* p. 17-27.
2. Have guidance counselor speak to class on job opportunities and requirements.
3. List books, movies, T.V. shows, etc. which depict computer crime. Weigh advantages against disadvantages (i.e. crime) to decide whether the computer in each instance is more valuable than harmful.
4. Filmstrips: "About the Future" from *Microcomputing* series.
   "What Do Computers Mean?" from *Computer Basics* series.
5. **Continuum of Values** — Arbitrary representation of agree/disagree spectrum. Students will stand on the continuum representing their individual opinions concerning specific statements made about computers. Continuum has varying degrees of agree/disagree. (i.e. sometimes agree, often agree.)
6. Role Play - Act out situations utilizing computers in everyday life.

ROBOTICS

Write a "1984" type story dealing with possible uses and innovations with robotics and the effects on society.

CULMINATING ACTIVITIES

1. Have students save worksheets, notes, original programs, computer-related games and stories throughout the course of study. Students then compile a fact book.
2. Become a computer - choose one of the following and relate how you function and feel; Mainframe, minicomputer, microcomputer, lap computer time, microwave, "instant bank teller", etc.

SUGGESTED ACTIVITIES CORRELATED TO THE Grades 9-12 Computer Curriculum

COMPUTER RELATED TERMINOLOGY

1. Filmstrip "Pebbles to Programs".
2. Utilize the Applesoft Tutorial.
3. Give students word finds and crossword puzzles containing computer terms.
4. Cassette with accompanying worksheet, "Computers-What Are They?"

HISTORY OF COMPUTERS

1. SRA Computer Discovery disks and workbooks.
2. Read *Introduction to Computers*.
3. Filmstrip "Pebbles to Programs."

USE OF THE COMPUTER AS A TOOL

1. Employ Applewriter IIe.
2. Utilize Supertext, Form Letter, and Address Book by Muse Software.
3. Use the Personal Filing System.
4. Read *Computers: Programming and Applications*.
5. Filmstrip "Pebbles to Programs".

COMMUNICATING INSTRUCTIONS TO THE COMPUTER

1. Do activities in the DISD packet.
2. Read *Introduction to Basic Programming*.
3. Read *Apple II User's Guide*.
4. Utilize Applesoft Tutorial.

SOCIAL IMPLICATIONS

1. Make bulletin board of social implications of computers.
2. Read *Computer Literacy*.

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